

d is the diameter in inches required for the intermediate shaft of the installation;

P is the diameter in inches of the screw propeller.

The value of K for ocean and cross-Channel steamers (Nos. 1 and 2 certificates, Board of Trade) is 120 when the liner is continuous, and 100 when the liners are non-continuous.

Tail shafts which are in stern tubes may have the end forward of the stern gland tapered down to a diameter at the coupling flange equal to 1.05 times that required for the intermediate shaft.

The taper of tail shafts at the propeller boss should be at the rate of i in. in 12; that is, a reduction in diameter of i in. to the foot.

Outboard and other intermediate shafts must be of sufficient size to avoid bending under their own weight or inertia to such an extent as to cause whipping.

The maximum unsupported length of shaft, that is the distance apart of their bearings as measured from their inner edges, shall be in accordance with the following rules:

When the maximum number of revolutions is R per minute.

For solid shafts whose diameter is d , in inches:

$$(a) L, \text{ the length in feet, } = \sqrt[3]{\frac{F A}{R}}.$$

For hollow shafts whose diameter is d and the bore is d^b both in inches:

$$(A) L, \text{ the length in feet, } = \sqrt[3]{\frac{F (d^3 - d^{b3})}{R}}.$$

For the outboard shafts of sea-going ships, F 125.

For the inboard shafts of sea-going ships, F 145.

For the shafts generally of ships habitually working in smooth water, F - 160.

CHAPTER III

High-speed Steam-engines

Introductory. - The high-speed enclosed self-lubricating steam-engine is substantially an English development. It came into existence in the early days of the electrical industry to meet the demand for a prime mover with a higher rotative speed than was then common, and suitable for direct coupling to dynamos which were then always belt driven, often by engines of the portable or semi-portable type. It met the needs of the

situation very well, and although not so economical as the slow-speed Corliss and drop-valve engine driving through belts or ropes, it greatly reduced capital cost, not only in the engines themselves but by requiring less floor space. The development of the infant electrical industry in this country was greatly helped by the introduction of this type of steam-engine. A feature soon found to be essential to its success was that of the self-lubrication of the moving parts, which in the famous Willans engine took the form of splash lubrication.